DATALOGIC™

DL Cordless Card™

Reference Manual

DATALOGIC™

Datalogic Mobile S.r.l.
Via S. Vitalino 13
40012 - Lippo di Calderara di Reno
Bologna - Italy

DL Cordless Card™

Ed.: 09/2007

This manual refers to software version 1.0 and later

CONTENTS

REFERENCES

CONVENTIONS

This manual uses the following conventions:

"User" refers to anyone using a DL Cordless Card™.
"DLCC" refers to the DL Cordless Card™.
"You" refers to the System Administrator or Technical Support person using this manual to install, configure, operate, maintain or troubleshoot a DLCC.

REFERENCE DOCUMENTATION

For further details refer to the card Quick Reference Manual and to the RHINO™ Reference Manual.

SERVICES AND SUPPORT

Datalogic provides several services as well as technical support through its website. Log on to **www.datalogic.com** and click on the links indicated for further information including:

- **PRODUCTS**

  Search through the links to arrive at your product page where you can download specific **Manuals** and **Software & Utilities** including:

- **SERVICES & SUPPORT**

  - **Datalogic Services -** Warranty Extensions and Maintenance Agreements

  - **Authorised Repair Centres**

- **CONTACT US**
  E-mail form and listing of Datalogic Subsidiaries

COMPLIANCE

RADIO COMPLIANCE

Contact the competent authority responsible for the management of radio frequency devices of your country to verify the eventual necessity of a user license.
Refer to the web site http://europa.eu.int/comm/enterprise/rtte/spectr.htm for further information.

CE ① **C** N2468

WEEE COMPLIANCE

Informazione degli utenti ai sensi della Direttiva Europea 2002/96/EC

L'apparecchiatura che riporta il simbolo del bidone barrato deve essere smaltita, alla fine della sua vita utile, separatamente dai rifiuti urbani.

Smaltire l'apparecchiatura in conformità alla presente Direttiva consente di:
- evitare possibili conseguenze negative per l'ambiente e per la salute umana che potrebbero invece essere causati dall'errato smaltimento dello stesso;
- recuperare materiali di cui è composto al fine di ottenere un importante risparmio di energia e di risorse.

Per maggiori dettagli sulle modalità di smaltimento, contattare il Fornitore dal quale è stata acquistata l'apparecchiatura o consultare la sezione dedicata sul sito www.mobile.datalogic.com.

Information for the user in accordance with the European Commission Directive 2002/96/EC

At the end of its useful life, the product marked with the crossed out wheeled wastebin must be disposed of separately from urban waste.

Disposing of the product according to this Directive:
- avoids potentially negative consequences to the environment and human health which otherwise could be caused by incorrect disposal
- enables the recovery of materials to obtain a significant savings of energy and resources.

For more detailed information about disposal, contact the supplier that provided you with the product in question or consult the dedicated section at the website www.mobile.datalogic.com.

Information aux utilisateurs concernant la Directive Européenne 2002/96/EC

Au terme de sa vie utile, le produit qui porte le symbole d'un caisson à ordures barré ne doit pas être éliminé avec les déchets urbains.

Éliminer ce produit selon cette Directive permet de:
- éviter les retombées négatives pour l'environnement et la santé dérivant d'une élimination incorrecte
- récupérer les matériaux dans le but d'une économie importante en termes d'énergie et de ressources

Pour obtenir des informations complémentaires concernant l'élimination, veuillez contacter le fournisseur auprès duquel vous avez acheté le produit ou consulter la section consacrée au site Web www.mobile.datalogic.com.

Información para el usuario de accuerdo con la Directiva Europea 2002/96/CE

Al final de su vida útil, el producto marcado con un simbolo de contenedor de bassura móvil tachado no debe eliminarse junto a los desechos urbanos.

Eliminar este producto de accuerdo con la Directiva permite de:
- evitar posibles consecuencias negativas para el medio ambiente y la salud derivadas de una eliminación inadecuada
- recuperar los materiales obteniendo así un ahorro importante de energía y recursos

Para obtener una información más detallada sobre la eliminación, por favor, póngase en contacto con el proveedor donde lo compró o consultar la sección dedicada en el Web site www.mobile.datalogic.com.

Benutzerinformation bezüglich Richtlinie 2002/96/EC der europäischen Kommission

Am Ende des Gerätelebenszyklus darf das Produkt nicht über den städtischen Hausmüll entsorgt werden. Eine entsprechende Mülltrennung ist erforderlich.

Beseitigung des Produkts entsprechend der Richtlinie:
- verhindert negative Auswirkungen für die Umwelt und die Gesundheit der Menschen
- ermöglicht die Wiederverwendung der Materialien und spart somit Energie und Resourcen

Weitere Informationen zu dieser Richtlinie erhalten sie von ihrem Lieferanten über den sie das Produkt erworben haben, oder besuchen sie unsere Hompage unter www.mobile.datalogic.com.

QUICK START

The following can be used as a checklist to verify all of the steps necessary for complete installation of the DL Cordless Card™ for a DOS terminal and for a laptop (with two PCMCIA overlaid slots for PC cards of type II and with Windows 98, ME, XP, and later versions).

Installing to portable PC

1) Read all information in the section "Safety Precautions" at the beginning of this manual.

2) Start your PC.

3) Insert the DLCC correctly in the PCMCIA slot. Refer to the PC user's manual.

Figure 1 - Laptop Card Installation

A) Windows notifies the PC has a new hardware device (DLCC);

B) Windows searches for a driver;

C) Insert the enclosed installation CD-ROM and follow the procedure;

D) At the end of the driver installation, Windows assigns DLCC a virtual COM port.

4) Configure the DLCC address according to your application. See "Configuration Methods".

> **NOTE**
>
> *The default communication parameters of the COM port are: 9600 baud, no parity, 8 data bits, 1 stop bit, handshaking disabled*

The installation is now complete.

Installing to DOS Terminal

Read all information in the section "Safety Precautions" at the beginning of this manual.

1) Rhino™ will recognize the card if the correct drivers are loaded. Therefore, before inserting the card into the terminal make sure that:

   - in NEWCFG.SYS the driver for the PCMCIA serial ports is loaded:
     A:\PCMCIA\PCMSCD.EXE

   - the scan engine driver is correctly configured (COM 3, interrupt 5) and loaded after PCMSCD.EXE:
     A:\DRIVERS\REDIR.SYS -c3 -i5 -b3

     The following is an example of the NEWCFG.SYS:

```
;Load PCMCIA drivers
DEVICE=A:\PCMCIA\CNFIGNAM.EXE /DEFAULT
DEVICE=A:\PCMCIA\PCMSSC40.EXE
DEVICE=A:\PCMCIA\PCMCSFUL.EXE
DEVICE=A:\PCMCIA\PCMRMAN.SYS
DEVICEHIGH=A:\PCMCIA\PCMSCD.EXE

; Scan Engine Device Driver
; (Emulate SE1200 on Com3 @ 9600 N-8-1 Irq5)
DEVICEHIGH=A:\DRIVERS\REDIR.SYS -c3 -i5 -b3
```

2) Insert the DLCC correctly in the PCMCIA slot. Refer to the terminal user's manual.

Figure 2 - DOS Terminal Card Installation

3) Start the DOS terminal. The system assigns DLCC a virtual COM port (COM 3, interrupt 5).

4) Configure the DLCC address according to your application. See "Configuration Methods" paragraph.

The default communication parameters of the COM port are: 9600 baud, no parity, 8 data bits, 1 stop bit, handshaking disabled

NOTE

The installation is now complete.

CONFIGURATION METHODS

DLCC configuration can be performed by four methods:

- **DL Mobile Configurator™** to set the primary DLCC parameters;

- **DL Sm@rtSet™** software configuration program;

- **configuration strings** sent from the Host via COM port;

- **DLCARD.EXE** DOS Configuration Program to perform a complete configuration of DLCC.

Your card is supplied with its own Quick Reference Manual which provides basic application parameter settings using configuration strings, default values, and specific technical features. You can see either your card's Quick Reference Manual or this manual for <u>initial configuration</u>.

To use this manual for initial setup see chapter 2.

If you need to change the default settings for your specific application, see chapter 3 and the Examples in appendix A.

DL Mobile Configurator™

Through this Windows-based utility program it is possible to configure the terminal and set the primary DLCC parameters from a PC. To send the configuration to the terminal connect the PC to Rhino™ via RS232. For more details about this configuration method refer to the DL Mobile Configurator™ manual.

DL Sm@rtSet™

DL Sm@rtSet™ program, available on the Datalogic website, is a Windows-based utility program providing a quick and user-friendly configuration method.
It allows defining the complete DLCC configuration and sending it directly to the card via virtual COM port.
Connect to www.datalogic.com/services/support/ to download the software.

Configuration Strings from Host

This configuration method may be used for initial and complete configuration (see chapter 2) by sending the desired strings provided in chapter 3 through the COM port. Batch files containing the desired parameter settings can be prepared to configure the card quickly and easily.
Reference notes describing the operation of more complex parameters are given in chapter 4.

DLCARD.EXE DOS Configuration Program

This configuration method allows setting DLCC through a vehicle mounted terminal running the DOS operating system.

Upon start, the DOS DLCARD.EXE program checks communication with DLCC. If the test is successful, the program will open the file DLCARD.INI that includes a list of keywords. The keywords accepted are the following:

- RESET_CFG, to reset card configuration to default (possible values: TRUE or FALSE)
- ADDRESS, to set the DLCC address (range 0 to 1999)
- TERMINATOR, to set the terminator (possible values: CR, CR+LF or NONE)
- CMD, to send any command configuration string

Here is an example of DLCARD.INI file:

```
[main]
reset_cfg = TRUE
address = 1973
terminator = cr

[commands]
;set minimum destination address
cmd = $+MS1234$-

;set maximum destination address
cmd = $+MT1235$-
```

The DLCC will be set consequently.

In the DOS command line, if you launch the DLCARD.EXE program with the parameter /?, the list of all the possible parameters will be shown.

Example: C:\ DLCARD /?

1   INTRODUCTION

The DL Cordless Card™ is a PCMCIA card developed to provide wireless 433 MHz RF communication between a laptop or a vehicle mounted terminal (Host) and Datalogic RF devices or base stations, which are STAR-System™ compatible:

-   Gryphon™ M Readers

-   Dragon™ M Laser Scanners

-   STAR★Modem™ Radio Modems

-   Formula Basic Line RF Terminals (F734-E/RF, F725-E/RF, F660-E/RF)

-   STARGATE™ Base Stations

1.1   OVERVIEW

DLCC provides a wireless bi-directional communication between the Host and the RF devices. DLCC installed in a vehicle mounted terminal is a Server (receiver) to the RF Devices and also a Client (transmitter) to STAR★Modem, which receives data for the printer (Figure 3).
STAR-System™ uses the Narrow Band RF radio and Datalogic CSMA/CA protocol to automatically link and manage all the RF devices in the system. This protocol manages the data transmission using a 16-bit CRC checksum. **All RF devices** in the system **must implement** the CSMA/CA **protocol** and therefore be configured using the STAR-System™ setup procedure.

Figure 3 – Bi-directional communication.

To configure the card for operating in this mode refer to paragraph 2.2.

1.2 LED INDICATOR

DL Cordless Card™ has one red LED as displayed in the following figure:

LED Indicator

Figure 4 - DLCC LED Indicator

The LED signals activity on PCMCIA interface.

2   INITIAL SETUP

For a correct DLCC configuration keep in mind the following:

- when using the DLCC for the first time, set the desired card address via COM Port, since its factory default address is "Undefined";

2.1   CONFIGURATION STRINGS

When using a DLCC on a terminal or a portable PC, initial setup can be performed via COM port by sending the configuration strings to the card using any terminal emulation program, for example Hyper Terminal.

> **NOTE**
>
> *Ensure that your PC COM port is set as follows:*
> *9600 baud, no parity, 8 data bits, 1 stop bit, handshaking disabled.*

The programming sequence is the following:

$+	*Command*	$-	CR

Carriage return character (0D Hex.)
Exit and Save configuration
Character sequence in following tables
Enter configuration environment

Example

Command programming sequence:

$+	RC1237	$-	CR

Carriage return character (0D Hex.)
Exit and Save configuration
DLCC address: 1237
Enter configuration environment

> **NOTE**
>
> *If you sent a wrong configuration string, you have to wait for a period of time equal to Rx timeout (default: 5 sec.) before sending the following configuration string.*

2.2 DLCC SETUP

RESTORE DEFAULT

Whenever necessary, send the following string to DLCC via COM Port to restore its default values. Otherwise skip to step 2:

1.	**Restore DLCC Default**	**$+$*CR**

This command does <u>not</u> change the DLCC address nor the destination device addresses, nor the RF Baud Rate parameters*.*

SET RADIO ADDRESSES

Follow the procedure below to set the DLCC radio address and prepare it to receive and transmit data to all devices included in the range from the First to the Last destination device.

2.	**Enter Configuration**	**$+**
3.	**Set DLCC Radio Address** xxxx = four digits for the DLCC address (from **0000** to **1999**). **This address must be unique.**	**RCxxxx**
4.	**First Destination Device Address** xxxx = four digits for the Destination Device address (from **0000** to **1999**).	**MSxxxx**
5.	**Last Destination Device Address** xxxx = four digits for the Destination Device address (from **0000** to **1999**). <u>If transmitting to one Destination device only, this selection is not required.</u>	**MTxxxx**
6.	**Exit and Save Configuration**	**$-CR**

Step 4 and 5 can be omitted when the card is used only to receive data (Server).

When a range of cable-connected destination devices (i.e. a Stargate™ RS485 network) is defined, DLCC activates roaming towards all these devices.

3   CONFIGURATION

Once the card is setup, you can change the default parameters to meet your application needs by sending the desired strings to the card via COM Port.

The following table lists all configuration commands which do not require the $-character:

Description	String
Enter Configuration	**$+**
Exit and Save Configuration	**$-**
Restore Default	**$+$*CR**
Transmit Software Release	**$+$!CR**
Transmit Configuration	**$+$&CR**

In this manual, the configuration parameters are divided into logical groups making it easy to find the desired function based on its reference group.

The configuration parameter groups are the following:

COM parameters allow the configuration of the COM port.

DATA FORMAT parameters regard the messages sent and received via COM port.

RADIO PARAMETERS allow configuration of radio protocol parameters.

NOTE

It is strongly recommended to read par. 4.1 in Radio and Serial Communication controls and the example applications in appendix A for correct parameter settings.

COM PORT PARAMETERS

⊙	*BAUD RATE*	⊙
⊙	*PARITY*	⊙
⊙	*DATA BITS*	⊙
⊙	*STOP BITS*	⊙
⊙	*HANDSHAKING*	⊙
⊙	*ACK/NACK PROTOCOL*	⊙
⊙	*FIFO*	⊙
⊙	*INTER-CHARACTER DELAY*	⊙
⊙	*RX TIMEOUT*	⊙
⊙	*FRAME PACKING*	⊙

The programming sequence is the following:

$+	*Command*	$-	CR

➤ Carriage return character (0D Hex.)

➤ Exit and Save configuration

➤ Character sequence in following tables

➤ Enter configuration environment

COM PORT

Description	String
BAUD RATE	
150 baud	**CD0**
300 baud	**CD1**
600 baud	**CD2**
1200 baud	**CD3**
2400 baud	**CD4**
4800 baud	**CD5**
9600 baud	**CD6**
19200 baud	**CD7**
38400 baud	**CD8**
57600 baud	**CD9**

PARITY	
None	**CC0**
Even parity	**CC1**
Odd parity	**CC2**

DATA BITS	
7 bits	**CA0**
8 bits	**CA1**
9 bits	**CA2**

STOP BITS	
1 bit	**CB0**
2 bits	**CB1**

COM PORT

Description	String
HANDSHAKING *see par. 4.2.1*	
Disable	**CE0**
Hardware (RTS/CTS)	**CE1**
Software (XON/XOFF)	**CE2**
RTS always ON	**CE3**
Modem (RTS/CTS)	**CE4**

Description	String
ACK/NACK PROTOCOL *see par. 4.2.2*	
Disabled	**ER0**
Enable ACK/NACK	**ER1**
Enable DATA/NACK	**ER2**

Description	String
FIFO *see par. 4.2.4*	
Disable	**ME1**
Enable	**ME0**

Description	String
INTER-CHARACTER DELAY	
Inter-character delay (ms)	**CK00 – CK99**

Description	String
RX TIMEOUT *see par. 4.2.3 and par. 4.2.5*	
RX Timeout (sec)	**CL00 – CL99**

Description	String
FRAME PACKING *see par. 4.2.5*	
Frame + [CR]	**ML0**
[STX] + Len + frame + [CR]	**ML1**
Frame after timeout	**ML2**

DATA FORMAT

⊙	*HEADER*	⊙
⊙	*TERMINATOR*	⊙
⊙	*HEADER POSITION*	⊙
⊙	*CODE LENGTH TX*	⊙
⊙	*ADDRESS STAMPING*	⊙
⊙	*ADDRESS DELIMITER*	⊙

The programming sequence is the following:

$+	*Command*	$-	CR

→ Carriage return character (0D Hex.)

→ Exit and Save configuration

→ Character sequence in following tables

→ Enter configuration environment

DATA FORMAT

Description	String
HEADER	
No header	**EA00**
One character header	**EA01*x***
Two character headers	**EA02*xx***
Three character headers	**EA03*xxx***
Four character headers	**EA04*xxxx***
Five character headers	**EA05*xxxxx***
Six character headers	**EA06*xxxxxx***
Seven character headers	**EA07*xxxxxxx***
Eight character headers	**EA08*xxxxxxxx***

Description	String
TERMINATOR	
No terminator	**EA10**
One character terminator	**EA11*x***
Two character terminators	**EA12*xx***
Three character terminators	**EA13*xxx***
Four character terminators	**EA14*xxxx***
Five character terminators	**EA15*xxxxx***
Six character terminators	**EA16*xxxxxx***
Seven character terminators	**EA17*xxxxxxx***
Eight character terminators	**EA18*xxxxxxxx***

x = HEX values representing an ASCII character.

x = HEX value from **00** to **FE** in Appendix B.

Example: Header = **AB**

	Two character header		A		B
	EA02	**+**	**41**	**+**	**42**

Example: Terminator = **CR LF**

	Two character terminator		CR		LF
	EA12	**+**	**0D**	**+**	**0A**

For more details see par. 4.3.1.

DATA FORMAT

Description	String
HEADER POSITION see par. 4.3.1	
First frame field	**ES0**
Before message field	**ES1**

CODE LENGTH TX	
Code length not transmitted	**EE0**
Code length transmitted in variable-digit length	**EE1**
Code length transmitted in fixed 4-digit format	**EE2**

The code length is transmitted in the message after the Headers and Code Identifier characters.
The code length is calculated after performing any field adjustment operations.

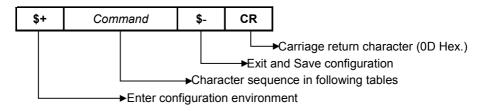| *ADDRESS STAMPING* see par. 4.3.2	
Disable	**RU0**
Enable	**RU1**

ADDRESS DELIMITER see par. 4.3.3	
Disable	**RV0**
Enable	**RV1*a***

a = a Hex value representing the ASCII character in the range from **00** to **FE** in Appendix B.

RADIO PARAMETERS

⊙   *RF BAUD RATE*   ⊙

⊙   *TRANSMISSION MODE*   ⊙

⊙   *RADIO PROTOCOL TIMEOUT*   ⊙

⊙   *SINGLE STORE*   ⊙

⊙   *ACK/NACK FROM REMOTE HOST*   ⊙

⊙   *BEACON*   ⊙

The programming sequence is the following:

$+	*Command*	$-	CR

→ Carriage return character (0D Hex.)

→ Exit and Save configuration

→ Character sequence in following tables

→ Enter configuration environment

RADIO PARAMETERS

Description	String
RF BAUD RATE see par. 4.4.1	
9600 baud	**MF0**
19200 baud	**MF1**

TRANSMISSION MODE (Client only) see par. 4.4.2	
1 way mode	**MW0**
2 way mode	**MW1**

RADIO PROTOCOL TIMEOUT (Client only) see par. 4.4.3	
Radio protocol timeout (seconds)	**MH01 – MH19**

SINGLE STORE (Client only) see par. 4.4.4	
Disable	**MO0**
One attempt	**MO1**
Two attempts	**MO2**
Three attempts	**MO3**
Four attempts	**MO4**
Five attempts	**MO5**
Six attempts	**MO6**
Seven attempts	**MO7**
Eight attempts	**MO8**
Continuous	**MO9**

RADIO PARAMETERS

Description	String
ACK/NACK FROM REMOTE HOST (Client only) see par. 4.4.5	
Disabled	**MR0**
Enable ACK/DATA/NACK	**MR1**

BEACON (Client only) see par. 4.4.6	
Disabled	**MB0**
Beacon every 2 seconds	**MB1**
Beacon every 3 seconds	**MB2**
Beacon every 4 seconds	**MB3**
Beacon every 5 seconds	**MB4**
Beacon every 6 seconds	**MB5**
Beacon every 8 seconds	**MB6**
Beacon every 10 seconds	**MB7**
Beacon every 20 seconds	**MB8**
Beacon every 30 seconds	**MB9**

4   PARAMETER ISSUES AND DEFINITIONS

4.1   RADIO AND SERIAL COMMUNICATION CONTROLS

DLCC communication can be controlled by several parameters depending on whether it is a Client or Server. DLCC can act as both Client and Server.

The following table summarizes which parameters are controlled by the Client and which ones are controlled by the Server.

Client (Transmitter) controlled parameters:	Server (Receiver) controlled parameters
Transmission Mode	ACK/NACK Protocol
ACK/NACK From Remote Host	Handshaking
FIFO	
Handshaking	
Single Store	

NOTE

To avoid incorrect interpretation of ACK characters, ACK/NACK Protocol and ACK/NACK From Remote Host cannot be simultaneously enabled on the same DLCC.

To help understand the various communication control possibilities among the different communication modes, we will analyze the communication control parameter settings for the following 3 cases:

1) DLCC acting as Server

2) DLCC acting as Client (like an RF device)

3) DLCC as client / server

Case 1 – DLCC as Server

Figure 5 –DLCC as Server

DLCC as a **Server** receives data from RF devices. The ACK/NACK Protocol parameter can be set to assure correct communication between DLCC and the local Host.
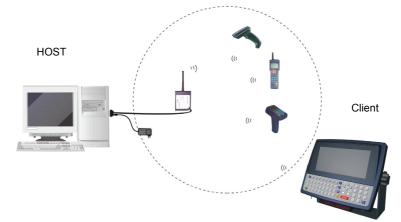
Assuming the RF devices are setup for 2 way transmission in STAR-System™ mode we can analyze the following ACK/NACK protocol selections:

   RF devices - *Transmission Mode = 2 ways*
   The Host must respond to a 2 way transmission

- If DLCC - *ACK/NACK = disabled*
  there is no control of the communication between DLCC and the Local Host. DLCC answers the RF device which initiated the 2 way transaction with DATA received from the Local Host.

- If DLCC - *ACK/NACK = enabled*
  when the Local Host receives a message correctly, it answers DLCC with the ACK character. Only then does DLCC acknowledge the RF device which initiated the 2 way transaction with an Empty Answer.

- DLCC - *DATA/NACK = enabled*
  when the Local Host receives a message correctly, it answers DLCC with DATA. DLCC then answers the RF device which initiated the 2 way transaction with this DATA (i.e. command to RF device display).
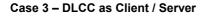
Case 2 – DLCC as Client (like an RF device)

HOST

Client

Figure 6 - DLCC Client

In the figure above, DLCC is a **Client** (as an RF device). The following parameters may be set depending on the application:

STAR★Modem™ - *ACK/NACK = enabled*
STAR-System™ - *Rx / Tx = enabled*

- If DLCC -   *Transmission Mode = 1 way*
                ACK/NACK from Remote Host = disabled
                FIFO = disabled
                Handshaking = modem (RTS/CTS)

In this case, DLCC sends data (messages) to the Remote Host. The special case of FIFO disabled blocks transmission until an acknowledgement is received from Host. Because ACK/NACK is enabled for STAR★Modem™, only after this has received an ACK from the Remote Host does it acknowledge reception (Empty Answer to DLCC).

Case 3 – DLCC as Client / Server

Client

HOST 1

Server

HOST 2

Figure 7 – DLCC as Client / Server

Both DLCCs are able to communicate bi-directionally. For analysis purposes only, we assume the situation where Host 1 is Client and Host 2 is Server. It is clear that the situation is analogous in the opposite direction:

- If DLCC 1 - *Transmission Mode = 1 way*
  ACK/NACK from Remote Host = disabled
  FIFO = enabled
  Handshaking = any

  The Client, (Host 1) sends a message to the Remote Host (Host 2), but no control exists upon reception and even if ACK/NACK Protocol is implemented on the Server side (Remote Host), no answer is returned from DLCC 2 to DLCC 1. This is not a secure communication.

- If DLCC 1 - *Transmission Mode = 1 way*
  ACK/NACK from Remote Host = enabled
  FIFO = enabled
  Handshaking = any

  The Client, (Host 1) sends a message to the Remote Host (Host 2). DLCC 2 acknowledges good radio reception but no control is made on Remote Host reception. If DLCC 2 acknowledges radio reception within the Radio Protocol Timeout, DLCC 1 sends ACK to its local Host, otherwise it sends NACK.

- If DLCC 1 -   *Transmission Mode = 2 ways*
  ACK/NACK from Remote Host = enabled
  FIFO = enabled
  Handshaking = any
  Single Store = enabled

The Client, (Host 1) sends a message to the Remote Host (Host 2) and expects an answer from Host 2. Host 2 answers with DATA (a string of up to 238 characters). If DLCC 2 sends this DATA answer within the Radio Protocol Timeout, DLCC 1 sends it to its local Host (Host 1), otherwise DLCC 1 sends NACK. In addition, the Single Store parameter upon Radio Protocol timeout, causes DLCC 1 to retry transmission of the same message the defined number of times, before responding to its local Host (Host 1) with NACK.

Host 1 -   *Handshaking = RTS/CTS*

- If DLCC 1 -   *Transmission Mode = any*
  ACK/NACK from Remote Host = enabled
  FIFO = disabled
  Handshaking = modem (RTS/CTS)

The Client, (Host 1) sends a message to the Remote Host (Host 2). DLCC 1 after receiving the message, blocks transmission of Host 1 until communication is completed according to the other communication control parameter settings as described above.

> *The most secure settings for bi-directional communication is to have ACK/NACK from Remote Host enabled and Two-way transmission at both ends. In addition, in case the first transmission fails, the Single Store parameter automatically repeats transmission of the same data packet up to the number of specified attempts.*
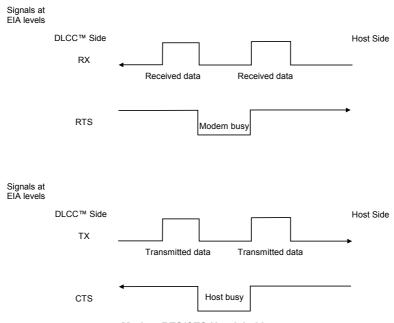>
> **NOTE**

4.2   COM PORT PARAMETERS
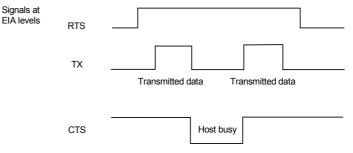
4.2.1   Handshaking

Modem: (RTS/CTS)

DLCC deactivates the RTS line when it cannot receive a character from the Host. DLCC can transmit data only if the CTS line (controlled by the Host) is active.

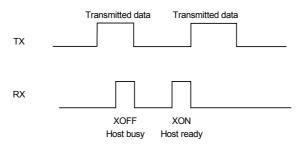**Modem RTS/CTS Handshaking**

Hardware handshaking: (RTS/CTS)

The RTS line is activated by DLCC before transmitting a character. Transmission is possible only if the CTS line (controlled by the Host) is active.

Signals at
EIA levels   RTS

                  TX

                  Transmitted data   Transmitted data

                  CTS   Host busy

Hardware RTS/CTS Handshaking

Software handshaking: (XON/XOFF)

During transmission, if the Host sends the XOFF character (13 Hex), the card interrupts the transmission with a maximum delay of one character and only resumes when the XON character (11 Hex) is received.

Transmitted data   Transmitted data

TX

RX

XOFF   XON
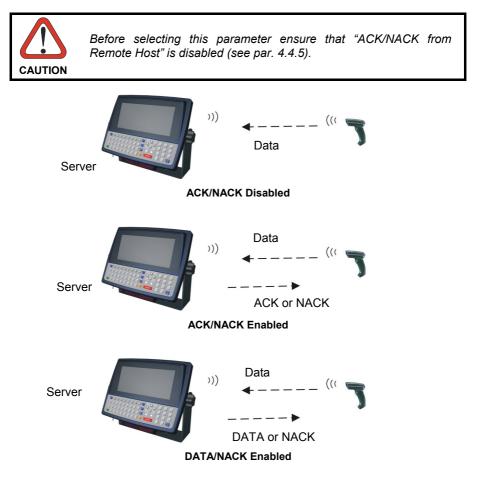Host busy   Host ready

Software XON/XOFF Handshaking

4.2.2   ACK/NACK Protocol

This parameter sets a transmission protocol which takes place between DLCC (Server) and an RF device. An RF device (such as a hand-held reader) passes its data (code read) to the card installed into the terminal. The Host sends an ACK character (06 HEX) to the card in the case of good reception; a NACK character (15 HEX) requesting re-transmission is sent to the card in case of bad reception.

In the particular case where the RF device is configured for 2 way transmission and therefore requires an answer, it is advised to set DLCC with the DATA/NACK protocol. The DATA answer from the Local Host is implicitly considered an ACK and is sent to the RF device. If instead ACK/NACK is used, the card generates an Empty Answer to the RF device.

> ⚠
> **CAUTION**
> *Before selecting this parameter ensure that "ACK/NACK from Remote Host" is disabled (see par. 4.4.5).*

Server

Data

ACK/NACK Disabled

Server

Data

ACK or NACK

ACK/NACK Enabled

Server

Data

DATA or NACK

DATA/NACK Enabled

If the card does not receive an ACK, DATA or NACK, transmission is ended after the RX Timeout (see par. 4.2.3). See also Radio Protocol Timeout, par. 4.4.3, for radio transmission to RF devices.

For ACK/NACK selection when DLCC as Client, is transmitting to a destination device connected to a Remote Host, refer to par. 4.1.

4.2.3   RX Timeout

This parameter can be used to automatically end data reception from the Local Host after the specified period of time.

If no character is received from the Local Host, after the timeout expires, any incomplete string is flushed from the card buffer.

Refer to par. 4.2.5 for RX Timeout functioning when defining the frame packing.

4.2.4   FIFO

If enabled, the Destination Device collects all messages sent by DLCC and sends them in the order of acquisition to the connected Remote Host.

If disabled, DLCC blocks the message transmission from the Local Host until an answer signaling the right/wrong message transmission has been received from the Destination Device (1 way) or the Remote Host (2 way). Once the answer has been received, the Local Host is allowed to send a new message.

This command requires the modem (RTS/CTS) handshaking to be enabled.

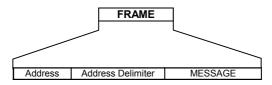For more details about the Transmission Mode refer to par. 4.4.2.

4.2.5   Frame Packing

This parameter defines the format of the frame to be transmitted between DLCC and the Host.
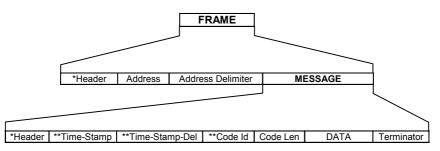The frame received by DLCC may contain a maximum of 238 characters. All characters not included within this number will be transmitted from the Host in a new frame.

Frame from Host to DLCC

```
                              ┌─────────────┐
                              │    FRAME    │
                              └─────────────┘
        ┌──────────┬──────────────────┬─────────────────┐
        │ Address  │ Address Delimiter │     MESSAGE     │
        └──────────┴──────────────────┴─────────────────┘
```

The Address field has different meanings depending on if the FRAME is sent as a 2 way answer to an RF device, or if it is a new message that the DLCC Client sends to a destination device. See par. 4.3.2 for details.
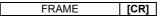
Frame from DLCC to Host

```
                              ┌─────────────┐
                              │    FRAME    │
                              └─────────────┘
  ┌──────────┬──────────┬──────────────────┬─────────────────┐
  │ *Header  │ Address  │ Address Delimiter │     MESSAGE     │
  └──────────┴──────────┴──────────────────┴─────────────────┘
 ┌─────────┬─────────────┬────────────────┬───────────┬──────────┬────────┬────────────┐
 │ *Header │ **Time-Stamp│ **Time-Stamp-Del│ **Code Id │ Code Len │  DATA  │ Terminator │
 └─────────┴─────────────┴────────────────┴───────────┴──────────┴────────┴────────────┘
```

*   There is only one header whose position can be defined through the related parameter (see par. 4.3.1).

**   These are optional fields which can be configured depending on the type of RF device used.

The Address field has different meanings depending on if the FRAME is a 2 way answer to a previous 2 way transaction initiated by a DLCC Client, or if it is a new message that an RF device sends to the DLCC Server. See par. 4.3.2 for details.
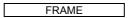
Correct FRAME identification is managed by frame packing. Three different types of frame packing can be selected:

- **Frame+ [CR]** *(default)*: the frame sent to DLCC is terminated by [CR]. This means you cannot use the [CR] character within the frame.
  In Frame + [CR] mode, make sure the FRAME does not contain [*CR]*, nor begin with *$+* or *#+* characters.

FRAME	**[CR]**

The frame transmitted by DLCC has no additional field. In this case the end of the FRAME is either DATA or Terminator if any.

FRAME

- **[STX]+LEN+Frame+[CR]**: both frames sent to and by DLCC are preceded by [STX], LEN and terminated by [CR], where LEN is a field of 4 digits and indicates the FRAME length in number of characters, that is FRAME +CR.

[STX]	**LEN**	FRAME	**[CR]**

In this mode, it is not necessary to use the Frame Packing to send commands. (i.e. $+$&[CR]).

The [STX], [CR] and [ESC] characters contained in the frame must be preceded by the [ESC] character for a correct transmission.

- **Frame after Timeout**: if the delay between two consecutive characters is more than the selected timeout, the card considers the frame completed. The timeout corresponds to 1/10 of the value defined for RX Timeout (see par. 4.2.3). Therefore, the timeout for frame packing is calculated in ms (from 10 ms to 990 ms).

> ☞ **NOTE**
> It is <u>not</u> possible to <u>disable</u> this timeout, therefore possible values are in the range 10 - 990 ms. If RX Timeout is disabled, Frame after Timeout is 10 ms.

Both the frames sent to and by DLCC have no additional fields:

FRAME

All commands to be sent using this frame packing must be preceded by the string below, which substitutes the $+ character:

#+++PROG_REQ+++#

This string is always transmitted in a single frame preceding the one containing the configuration command, as shown in the following examples:

Example 1

Sending the $+$![CR] command to transmit the card software release:
1st Frame = #+++PROG_REQ+++#
2nd Frame = $![CR]

Example 2

Sending the $+ML0$-[CR] command to set the default frame packing configuration:
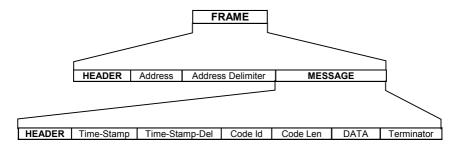1st Frame = #+++PROG_REQ+++#
2nd Frame = ML0$-[CR]

4.3   DATA FORMAT

4.3.1   Header/Terminator Selection

The header/terminator selection is not effected by restore default command.

Header Position

This parameter defines the header position within the frame to be transmitted from DLCC to the Host. The header can be positioned in either the first field of the frame or in the field preceding the message:

The Address field has different meanings depending on if the FRAME is a 2 way answer to a previous 2 way transaction initiated by a DLCC Client, or if it is a new message that an RF device sends to the DLCC Server. See par. 4.3.2 for details.

4.3.2 Address Stamping

If enabled, this command includes the RF device or DLCC address in the message/answer transmitted. It is advised to enable this parameter when DLCC is a Server for more than one Client in 2 way transmission. In this way the Host knows to which Client the answer must be sent.

If receiving data from an RF device working in 1 way mode, DLCC (Server) automatically includes the RF device address in the message to be sent to the Host.

If receiving data from an RF device working in 2 way mode, DLCC (Server) automatically includes the RF device address in the message to be sent to the Host. It is required to set the Host application to include the same address in the answer to be transmitted back to the RF device.
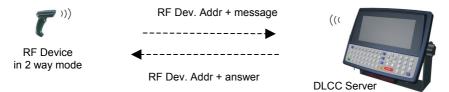

RF Dev. Addr + message

RF Device
in 2 way mode

RF Dev. Addr + answer

DLCC Server

Figure 8 - Receiving a Message from RF device in 2 Way Mode

If DLCC as Client, is transmitting to more than one destination device (see the three Stargates in the figure below) in 1 way mode, it is necessary to set its Host application to include the card address in the message to be transmitted to the destination devices of the system.
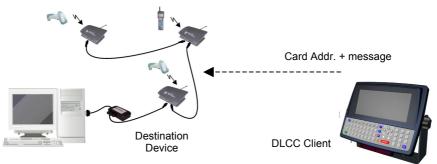

Card Addr. + message

Destination
Device

DLCC Client

Figure 9 - Transmitting a Message in 1 Way Mode

If DLCC as Client, is <u>transmitting</u> to more than one destination device (see the three Stargates in the following figure) in 2 way mode, it is necessary to set its Host application to include the card address in the message to be transmitted to the destination devices of the system. DLCC will include the same address in the answer it receives from the destination devices and sends back to the Host.
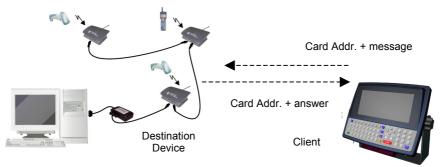

Figure 10 - Transmitting a Message in 2 Way Mode

The Address Stamping parameters consist of a 4-digit number in the range 0000-1999.

NOTE	*When the card receives data in <u>2 way mode from more than one RF device</u>, it is advised to enable Address Stamping for correct radio transaction management.*

NOTE	*If communicating with <u>only one RF device</u> in 2 way mode, Address Stamping is not required, since the data/answer generated by the Host is only sent to that device. In this case* DLCC *can receive data (messages) via radio only after sending the 2 way answer.*

4.3.3   Address Delimiter

The Address Delimiter allows a character to be included to separate the Address stamping fields from the next fields in the message. Once enabled, it is required to set the Host application to include the Address Delimiter character in the message. Any character can be included in the hexadecimal range from 00 to FE.

4.4   RADIO PARAMETERS

4.4.1   RF Baud Rate

This parameter defines the baud rate used for radio communication. The baud rate value can be set to 9600 or 19200 according to the device communicating with DLCC. 19200 is the default value.

4.4.2   Transmission Mode (Client only)

DLCC Client can communicate within the system using two different transmission modes:

- 1 way mode: (default)   DLCC transmits data without requiring an acknowledgement answer from the Remote Host (see par. 4.1 for details).

- 2 way mode: DLCC transmits data requiring an acknowledgement answer from the Remote Host (see par. 4.1 and par. 4.4.5 for details.

4.4.3   Radio Protocol Timeout (Client only)

This parameter sets the valid time to wait before radio transmission between DLCC and a destination device is considered failed.

This parameter should be set taking into consideration the radio traffic (number of devices in the same area).

If the RS232 interface connecting the Remote Host and the destination device is used with ACK/NACK enabled, this parameter should be at least equal to the RX Timeout parameter for low traffic environments. It should be increased if there are many devices in the same area.

4.4.4   Single Store (Client only)

This command is active when DLCC (Client) transmits messages/data to a destination device.
It guarantees a secure control to prevent the transmission of duplicated data.
If Single Store is enabled and DLCC does not receive any answer of good transmission from the destination device, it enters a special operating mode that stops sending new messages. When such operating mode is entered, the card retries transmission itself for the number of attempts selected in the configuration.

Once the transmission is successful, the card continues to send new messages. If transmission is not successful after the number of configured attempts, the message is lost.

To be absolutely sure that messages are received by the destination device, set Single Store to continuous. A new message will not be sent unless the previous one is received. If using Single Store as continuous, and the transaction is not received, check that the Server is active and that the DLCC configuration is correct.

If your application requires an acknowledgement from the Remote PC, you must define Single Store and enable ACK/NACK From Remote Host (see par. 4.4.5).

4.4.5   ACK/NACK From Remote Host (Client only)

This parameter sets a transmission protocol which takes place between the DLCC (Client) Host and the destination device Host (Remote Host). The transmission is influenced by the transmission mode selected (see par. 4.4.2).
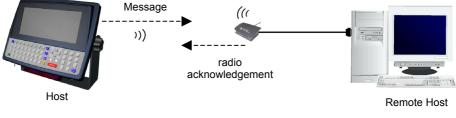
> ⚠ *Before selecting this parameter ensure that "ACK/NACK Protocol" is disabled (see par. 4.2.2).*
> **CAUTION**

One way mode:

Host sends a message to DLCC which passes it to the destination device via radio. In case of good transmission, the destination device transmits a radio acknowledgement back to the card. If received before the Radio Protocol Timeout expires, DLCC sends an ACK character to the Host. If the timeout expires before receiving any acknowledgement, the card transmits a NACK character.
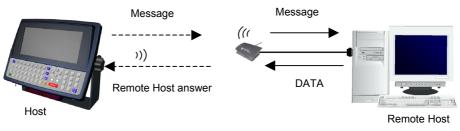

Message

radio
acknowledgement

Host

Remote Host

1 Way Transmission Mode

Two way mode:

Host sends a message to DLCC which passes it to the destination device via radio. The destination device transmits the message to the Remote Host which responds with DATA. This answer is sent to DLCC through the destination device. Then, the card transmits it to the Host.
If the Radio Protocol Timeout expires before the answer from Remote Host is received by DLCC or in case the Remote Host does not respond, DLCC sends a NACK character to the Host.

Message   Message

Remote Host answer   DATA

Host

Remote Host

2 Way Transmission Mode

NOTE

If the Host continues to send new messages before receiving any answer from the Remote Host, it is strongly suggested to enable the handshaking on the Host connected to DLCC *for a correct functioning.*

4.4.6   Beacon (Client only)

If this parameter is enabled, DLCC polls the server for data at regular intervals (configurable from 2 to 30 seconds) by sending a character ENQ (ASCII 05) with a 2 way transaction. The server must always respond with data or with an Empty Answer.
The selection of this parameter does not influence the card normal radio transaction. This means that it does not modify the transmission of data sent by the Local Host.

5 DEFAULT CONFIGURATION

Configuration Parameter	Default Setting
Serial Communication	
Baud Rate	9600
Parity, Data Bits, Stop Bits	No parity; 8 Data bits; 1 Stop bit
Handshaking	Disabled
ACK/NACK Protocol	Disabled
FIFO	Enabled
Intercharacter Delay	Disabled
RX Timeout	5 seconds
Frame Packing	Frame +[CR]
Data Format	
Header	No headers
Terminator	[CR] and [LF]
Header Position	First frame field
Code Length TX	Code Length not Transmitted
Address Stamping	Disabled
Address Delimiter	Disabled
Radio Parameters	
RF Baud Rate	19200 baud
Transmission Mode	1 way mode
Radio Protocol Timeout	2 sec
Single Store	Disabled
ACK/NACK from Remote Host	Disabled
Beacon	Disabled

6   TECHNICAL FEATURES

Electrical Features	
Supply voltage	5 Vdc ± 3%
Power consumption	400 mW
Indicator	One red LED
Radio Features	
Working frequency	433.92 Mhz
Bit rate	Up to 19200 baud
Effective Radiated Power	<10 mW
Range (in open air)	15 m / 49.2 ft
RF Modulation	FSK
System Configuration	
Maximum number of client RF devices supported by a DLCC server	32
Environmental Features	
Working temperature	-20° to +50 °C / -4° to +122 °F
Storage temperature	-20° to +70 °C / -4° to +158 °F
Humidity	90% non condensing
Protection class	IP30
Mechanical Features	
Weight	47 gr
Dimensions	118.25 mm x 54 mm x 9.4 mm

A   TYPICAL SYSTEM LAYOUTS

The following examples give a graphical representation of DLCC applications in 2 typical layouts and provide the software configuration required by each device to communicate within the system (see par. 4.1 for details about the main parameter functioning).

The examples provide two different DLCC applications:

-    **Example 1   DLCC Server**

          DLCC, installed in a vehicle-mounted terminal, receives data from Datalogic hand-held devices;

-    **Example 2:   Bi-Directional Communication**

          Two DLCCs are installed into two different Hosts and communicate via radio transmitting/receiving data.

A.1 DLCC SERVER

DLCC is installed into a Rhino™ vehicle mounted terminal and <u>receives</u> data from a DRAGON™ M scanner.
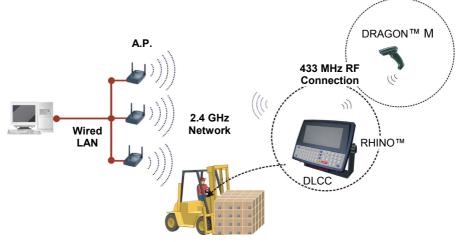

Figure 11 - DLCC Server Installed into Rhino™

This layout shows the integration of the 433 MHz and 2.4 GHz networks for data collection.
To define this type of communication, the system devices may be configured as follows:

DLCC	-	Setup for Server Only Functioning
	-	DLCC Radio Address = **0017**
RHINO™	-	Run an application managing the data communication between the mobile computer and the host system, for example Terminal Emulation.
DRAGON™ M	-	Setup for STAR-System mode
	-	DRAGON™ M Radio Address = 1235
	-	Destination Address = **0017**

A.2   BI-DIRECTIONAL COMMUNICATION

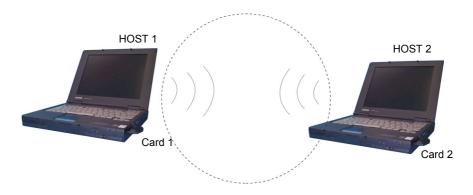Two DLCCs are installed into the dedicated Host. They communicate with each other by transmitting and receiving data.

Figure 12 – Bi-directional Communication

Each system device may be configured as follows:

DLCC 1	-	DLCC Radio Address = **0325**
	-	First Destination Device Address = 0263
	-	Handshaking = modem (RTS/CTS)
	-	Frame Packing = frame after timeout (selection advised for this example for a faster transmission)
HOST 1	-	Run the desired application or a terminal emulation program.
	-	Adjust the Host communication parameters and handshaking according to DLCC 1.
DLCC 2	-	DLCC Radio Address = **0263**
	-	First Destination Device Address = 0325
	-	Handshaking = modem (RTS/CTS)
	-	Frame Packing = frame after timeout
HOST 2	-	Run the desired application or a terminal emulation program.
	-	Adjust the Host communication parameters and handshaking according to DLCC 2.

B   HEX AND NUMERIC TABLE

CHARACTER TO HEX CONVERSION TABLE					
char	hex	char	hex	char	hex
NUL	00	*	2A	U	55
SOH	01	+	2B	V	56
STX	02	,	2C	W	57
ETX	03	-	2D	X	58
EOT	04	.	2E	Y	59
ENQ	05	/	2F	Z	5A
ACK	06	0	30	[	5B
BEL	07	1	31	\	5C
BS	08	2	32	]	5D
HT	09	3	33	^	5E
LF	0A	4	34		5F
VT	0B	5	35	`	60
FF	0C	6	36	a	61
CR	0D	7	37	b	62
SO	0E	8	38	c	63
SI	0F	9	39	d	64
DLE	10	:	3A	e	65
DC1	11	;	3B	f	66
DC2	12	<	3C	g	67
DC3	13	=	3D	h	68
DC4	14	>	3E	i	69
NAK	15	?	3F	j	6A
SYN	16	@	40	k	6B
ETB	17	A	41	l	6C
CAN	18	B	42	m	6D
EM	19	C	43	n	6E
SUB	1A	D	44	o	6F
ESC	1B	E	45	p	70
FS	1C	F	46	q	71
GS	1D	G	47	r	72
RS	1E	H	48	s	73
US	1F	I	49	t	74
SPACE	20	J	4A	u	75
!	21	K	4B	v	76
"	22	L	4C	w	77
#	23	M	4D	x	78
$	24	N	4E	y	79
%	25	O	4F	z	7A
&	26	P	50	{	7B
'	27	Q	51	|	7C
(	28	R	52	}	7D
)	29	S	53	~	7E
		T	54	DEL	7F

GLOSSARY

1 way transmission	a radio transmission in which DLCC transmits data without requiring an acknowledgement answer from the remote Host.
2 way transmission	a radio transmission in which DLCC transmits data requiring an acknowledgement answer from the remote Host.
Client	a radio device which can initiate a 1 way or 2 way transmission to a Server. The <u>Client</u> is also defined as <u>Transmitter</u>. DLCC, RF terminals or RF hand-held readers function as Clients.
Server	a radio device which is continuously waiting for a 1 way or 2 way transmission initiated by a Client. The <u>Server</u> is also defined as <u>Receiver</u>. DLCC or Stargates™ function as Servers.
Bi-directional Communication	the ability to both receive radio messages as a Server and to initiate radio transmission as a Client.
Destination Device	the radio device to which a message must be sent or to which an answer to a previously received message must be given.
DATA	a string of up to 238 characters sent by a client to a server, or received by a client as a 2 way response.
Empty Answer	a radio acknowledgement containing no information (data) content.
Local Host	the Host to which DLCC is physically inserted in.
Remote Host	the Host to which a <u>transmitting</u> DLCC Client sends a message via radio.
STAR-System™	a Datalogic radio communication system that uses a Narrow Band RF radio and Datalogic proprietary CSMA/CA protocol to automatically link and manage all the RF devices in the system.

INDEX

Datalogic Mobile S.r.l.
Via S. Vitalino 13
40012 - Lippo di Calderara
Bologna - Italy

ϵ 07

dichiara che
declares that the
déclare que le
bescheinigt, daß das Gerät
declare que el

DL Cordless Card EU, Radio Modem with PCMCIA Interface

e tutti i suoi modelli
and all its models
et tous ses modèles
und seine modelle
y todos sus modelos

sono conformi alla Direttiva del Consiglio Europeo sottoelencata:
are in conformity with the requirements of the European Council Directive listed below:
sont conformes aux spécifications de la Directive de l'Union Européenne ci-dessous:
der nachstehenden angeführten Direktive des Europäischen Rats:
cumple con los requisitos de la Directiva del Consejo Europeo, según la lista siguiente:

1999/5/EEC R&TTE

Questa dichiarazione è basata sulla conformità dei prodotti alle norme seguenti:
This declaration is based upon compliance of the products to the following standards:
Cette déclaration repose sur la conformité des produits aux normes suivantes:
Diese Erklärung basiert darauf, daß das Produkt den folgenden Normen entspricht:
Esta declaración se basa en el cumplimiento de los productos con las siguientes normas:

ETSI EN 301 489-3 v 1.4.1, AUGUST 2002: ELECTROMAGNETIC COMPATIBILITY AND RADIO SPECTRUM MATTERS (ERM); ELECTROMAGNETIC COMPATIBILITY (EMC) STANDARD FOR RADIO EQUIPMENT AND SERVICES; PART 3: SPECIFIC CONDITIONS FOR SHORT-RANGE DEVICES (SRD) OPERATING ON FREQUENCIES BETWEEN 9 KHZ AND 40 GHZ.

ETSI EN 300 220 v 1.1.1, SEPTEMBER 2004: ELECTROMAGNETIC COMPATIBILITY AND RADIO SPECTRUM MATTERS (ERM); SHORT-RANGE DEVICES (SRD); RADIO EQUIPMENT TO BE USED IN THE 25 MHZ TO 1000 MHZ FREQUENCY RANGE WITH POWER LEVELS RANGING UP TO 500 MW; PART 3: HARMONIZED EN COVERING ESSENTIAL REQUIREMENTS UNDER ARTICLE 3.2 OF THE R&TTE DIRECTIVE

EN 60950-1, DECEMBER 2001: INFORMATION TECHNOLOGY EQUIPMENT – SAFETY – PART 1: GENERAL REQUIREMENTS.

Lippo di Calderara, September 3rd, 2007

Paola Chientaroli
Quality Assurance Manager

ODATALOGIC™

www.mobile.datalogic.com

World wide Sales Network
available from: www.mobile.datalogic.com/contacts

09/07